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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/986,987	11/13/2001	Takanobu Nishida	900-407	6028

23117 7590 09/19/2005

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ARLINGTON, VA 22203

EXAMINER
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OLSEN, ALLAN W

ART UNIT	PAPER NUMBER
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1763

DATE MAILED: 09/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/986,987

Applicant(s)

NISHIDA, TAKANOBU

Examiner

Allan Olsen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 27 July 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-4,7-11,13,14,16-20,22 and 23 is/are pending in the application.

4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.

- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.

- 6) ☒ Claim(s) 1-4,7-11,13,14,16-20,22 and 23 is/are rejected.

- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.

- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 November 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2/26/04 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

On July 27, 2005, a request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 3, 2005 has been entered.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-4, 7-11, 13, 14, 16-20, 22 and 23 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claims contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor, at the time the application was filed, had possession of the claimed invention. The newly recited "substantially pure oxygen" does not find support in the application as originally filed. Applicant states the support for this amendment is found in the phrase, "an almost pure oxygen gas" (specification - page 7, line 7).

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

**Claims 19 is rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,440,864 issued to Kropewnicki et al (hereinafter, Kropewnicki).**

Kropewnicki teaches ashing a layer of photoresist that overlies a low k dielectric. Kropewnicki teaches ashing with an oxygen plasma generated with an RF plasma source providing 100-5000 W of power while the pedestal electrode, upon which the substrate is supported, is RF biased with a power of 75-500 W (see, for example: col. 12, Ins 48-52; col. 11, Ins 22-25 and col. 10, In 41). These power limits provide for a source/bias power ratio of as low as 0.2. With respect to the substantially pure oxygen limitation, it is noted that Kropewnicki teaches using oxygen as a cleaning/ashing gas and that the addition of an additive is optional (col. 6, Ins 48-65 and column 10, Ins 42-43). As Kropewnicki teaches etching the same material with the same gases and under the same conditions as the claimed invention, the formation of a protective film it is considered to be an inherent feature of Kropewnicki.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

**Claims 1-4, 7-11, 13, 14, 16-20, 22 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent Kropewnicki in view of U.S Patent 5,453,157 issued to Jeng.**

The above noted teachings of Kropewnicki are herein relied upon. Additionally, it is noted that Kropewnicki teaches using a temperature controlled pedestal electrode to support the substrate. Kropewnicki teaches a temperature of about 15°C to about 20°C (col 7, ln 27).

Kropewnicki does not explicitly teach that the low-k material is not damaged or that the value of the dielectric constant does not change by more than 10 %.

It would have been obvious to one skilled in the art to conduct the method of Kropewnicki in a manner that did not cause the dielectric constant of the low- k material to change by  $\geq 10\%$  because Kropewnicki teaches the ashing of photoresist from atop a material having a dielectric constant of less than about 3.2 and more preferably less than about 3.0. As such, the dielectric constant of a material with the preferred dielectric constant of 3.0 cannot change by  $\geq 10\%$  because this would result in a dielectric constant that exceeds Kropewnicki's upper limit of 3.2

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As noted above, Kropewnicki teaches a temperature of about 15°C to about 20°C. While the examiner believes this temperature is recited in reference to the substrate temperature, Kropewnicki is not explicit on this point.

Jeng teaches a method of ashing photoresist that overlies a low-k dielectric layer. Jeng teaches that damage to polymeric low-k dielectric materials, such as those used by Kropewnicki, can be eliminated by maintaining the temperature of the substrate between -20° C and 20°C during the photoresist ashing process.

It would have been obvious to one skilled in the art to maintain a substrate temperature of 20°C or less while carrying out the method of Kropewnicki because Kropewnicki is directed to a process of ashing photoresist in the presence of low-k dielectric materials and Jeng teaches that damage to the dielectric material can be eliminated by maintaining a low substrate temperature. Even if the skilled artisan does not presume that Kropewnicki's teaching of a 15°C-20°C temperature is directed to the substrate temperature, the skilled artisan would, nevertheless, be motivated to use the low substrate temperature of Jeng because Jeng teaches that this eliminates damage to the low-k material, which in turn eliminates the prospect of bringing about deleterious changes in the value of the dielectric constant.

Regarding claim 15, Kropewnicki does not teach the formation of a protective film on the surface of the insulating film. However, like Applicant, Kropewnicki teaches using a silicon-containing organic polymer as the low k insulating film. Applicant's specification (page 10) attributes the formation of protection film to the migration of silicon to the surface to react with the reactive oxygen species generated from the

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plasma. Kropewnicki does not discuss this aspect of the claimed invention; nevertheless, because Kropewnicki's process and the claimed process are the same, the claimed protective film is considered to be an inherent feature of Kropewnicki.

### ***Response to Arguments***

Applicant's arguments filed June 3, 2005 have been fully considered and they are not persuasive with respect to Kropewnicki.

Applicant argues that Kropewnicki does not teach the ashing method of the claimed invention in which the ratio of  $W_s/W_b$  is set to 5 or smaller.

The examiner addressed Kropewnicki's teaching regarding this ratio in the 102 rejection above. For a specific example, note the 2400 W source power (col. 10, ln 41) coupled with the application of up to 500 W of bias power (col. 11, ln 25) which provides a ratio of 4.8:1.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allan Olsen whose telephone number is 571-272-1441. The examiner can normally be reached on M-F 1-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read "Allan Olsen", with a stylized, cursive script.

Allan Olsen  
Primary Examiner  
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